

# Math576 Combinatorial Game Theory

## Homework 4

due midnight of Friday, Oct. 30, 2020

Submission method: Your answers to Homework 4 must be converted into a single pdf file. Then login to Blackboard. Click on assignments/homework4. Upload your answers. You can try to upload twice. Only last version will be graded.

1. Simplify the following game values.
  - (a)  $\{0, \downarrow \mid 0, *, \uparrow\}$
  - (b)  $\{* \mid 0, *\}$
  - (c)  $\{\downarrow, 0 \mid 0, \uparrow *\}$
  - (d)  $\{\uparrow \mid \uparrow\}$
  - (e)  $\{0, * \mid *2, \uparrow\}$
2. Prove that  $\{*2 \mid 0\} = \downarrow *3$ .
3. Two player play the Kayles game. There are three blocks of pins with sizes 7, 8, 9 respectively. What is the game value? What is the winning move for the first player?
4. Find the nim sequence for the subtraction game  $S(2, 3, 6, 8)$ . What is the period of this nim sequence?
5. Explain what rules is for the Take-and-Break Games .34, then find the nim sequence.